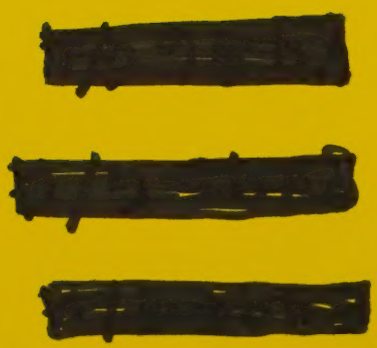
SERIES 1000

BETA ELECTRIC. CORP.



SORENSEN 1030-20 REV D
BC 198912

BETA ELECTRIC CORP.,

NEW YORK 29, N. Y.

INSTRUCTION MANUAL

SERIES 1000

BEFORE YOU BEGIN TO USE YOUR NEW BETA INSTRUMENT, WE SUGGEST THAT YOU READ THIS INSTRUCTION MANUAL VERY CAREFULLY. THE INFORMATION CONTAINED HEREIN IS DESIGNED TO HELP YOU OBTAIN THE MAXIMUM IN PERFORMANCE AND MANY YEARS OF DEPENDABLE SERVICE FROM YOUR INSTRUMENT.

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5/1/58

SCOPE AND SPECIFICATIONS

This is an instruction manual for all βeta Electric Series 1000 Power Supplies for the Research & Development (R&D) designs less optional features. Information and specifications with regard to the optional features (C1, L2, C2, etc.) can readily be obtained by referring to the Product Data Sheet enclosed.

SECTION I. GENERAL SERVICE & WARRANTY INFORMATION

A: SHIPPING DAMAGE:

The instrument should be inspected and tested immediately upon arrival. In the event the unit fails to operate properly or is damaged in any way, the carrier should be notified at once. When the claim agent has inspected the shipment and prepared a report of damage, a copy of this report should be sent to us. At that time we will advise you concerning the repair or replacement of the instrument.

B: SERVICE AND INFORMATION:

All questions concerning the operation or malfunctioning of this instrument should be directed to our representative in your immediate area. A listing of our representatives can be found on the inside cover of this instruction manual.

I M P O R T A N T

BE SURE TO INCLUDE THE MODEL AND SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS INSTRUMENT. WITHOUT THIS INFORMATION WE WILL NOT BE ABLE TO GIVE YOU PROMPT SERVICE.

Should you receive a defective or damaged instrument or require service on an instrument in or out of warranty, please contact our representative. Be sure to include as much information as possible concerning the difficulty. This information should include symptoms, application etc. The more information you give us, the faster we can determine the extent of your difficulty.

In each case our representative will decide whether the instrument requiring service will be: (a) serviced at your plant by them. (b) shipped to a service station, or (c) returned to the factory.

If the instrument should be returned to the factory, we will send you a Shipping Release and a Service Tag which should be filled out and affixed to unit. DO NOT SHIP A UNIT TO THE FACTORY WITHOUT THIS TAG (Unless specific authorization has been received to do so).

C: SHIPMENTS:

All shipments to βeta must be prepaid unless we authorize to the contrary. The power supply should be wrapped in heavy paper and

SCOPE AND SPECIFICATIONS

This is an instruction manual for all Beta Electric Series 1000 Power Supplies for the Research & Development (R&D) designs lacking optional features. Information and specifications with regard to the optional features (C2, I2, C2, etc.) can readily be obtained by referring to the Product Data Sheet enclosed.

SECTION I. GENERAL SERVICE & WARRANTY INFORMATION

A: SHIPPING DAMAGE:

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C: SHIPMENTS:

All shipments to Beta must be prepaid unless we authorize to the contrary. The power supply should be wrapped in heavy paper and

packed in the original container or a wooden box with at least three inches of shock absorbent material on all sides. In oil insulated units, do not ship the unit with oil.

Make certain all tubes, if any, are removed and shipped separately. All movable objects such as tube plate caps, solenoids, etc. should be fastened securely.

All meters must be shorted.

Please return instruction manual with unit to be repaired.

D: WARRANTY:

This instrument is warranted by the βeta Electric Corp., to be free from defects in material and workmanship. Our obligation to the original purchaser under the warranty is limited to servicing the instrument and replacing defective parts, with the exception of tubes on which there is only the manufacturer's guarantee. This guarantee is valid only if the instrument has not been abused mechanically , and the operational limitations prescribed in instruction manual have been adhered to.

The period of warranty is one year after the date of delivery of the instrument to the original purchaser.

Defects caused by improper operating conditions, accidents, misuse, or negligence, and the removal of the serial plate, will void the warranty.

* *

SECTION II - GENERAL DESCRIPTION

The βeta Electric Series 1000 air and oil insulated power supplies, 0-1000 to 0-60,000 volts, at currents ranging from 1 ma at 60,000 volts, to 500 ma at 1000 volts, limited by a power rating of 600 watts output, have been specifically designed to provide reliable, safe, high voltage breakdown testers, for insulating materials and television components. B + sources for power tubes or cathode ray tubes, etc. with unusually long life. A noteworthy feature of this series is the ability to surge the high voltage at any magnitude of high voltage and current output.

They are also applicable to any requirement where no more than 600 watts of high or very high voltage ** dc power is needed, such as nuclear

* *

** VOLTAGE RANGE	AT LEAST (VOLTS)		BUT LESS THAN
LOWEST OUTPUT	200	TO	300 ✓
MEDIUM	300	TO	3,000 ✓
MEDIUM HIGH	300	TO	10,000 ✓
	"HIGHER VOLTAGES"		
~~HIGH~~	~~3,000~~		
VERY HIGH TO	30,000		
~~ULTRA HIGH~~	~~300,000 and above~~		

packed in the original container or a wooden box with at least three inches of shock absorbent material on all sides. In oil insulated units, do not ship the unit with oil.

Make certain all tubes, if any, are removed and shipped separately. All movable objects such as tube plate caps, solenoids, etc. should be fastened securely.

ALL meters must be shorted.

Please return instruction manual with unit to be repaired.

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This instrument is warranted by the Beta Electric Corp., to be free from defects in material and workmanship. Our obligation to the original purchaser under the warranty is limited to servicing the instrument and replacing defective parts, with the exception of tubes on which there is only the manufacturer's guarantee. This guarantee is valid only if the instrument has not been abused mechanically , and the operational limitations prescribed in instruction manual have been adhered to.

The period of warranty is one year after the date of delivery of the instrument to the original purchaser.

Defects caused by improper operating conditions, accidents, misuse, or negligence, and the removal of the seal[illegible] will void the warranty.

* *

SECTION II - GENERAL DESCRIPTION

The Beta Electric Series 1000 air and oil insulated power supplies, 0-1000 to 0-60,000 volts, at currents ranging from 1 ma at 60,000 volts, to 200 ma at 1000 volts, limited by a power rating of 600 watts output, have been specifically designed to provide reliable, safe, high voltage breakdown testers, for insulating materials and television components. R + sources for power tubes or cathode ray tubes, etc. with unusually long life. A noteworthy feature of this series is the ability to surge the high voltage at any magnitude of high voltage and current output.

They are also applicable to any requirement where no more than 600 watts of high or very high voltage ** dc power is needed, such as nuclear

* *

** VOLTAGE RANGE	AT LEAST	BUT LESS THAN
	(VOLTS)	
LOW	[illegible]	300
MEDIUM	300	3,000
"HIGHER VOLTAGES"		
HIGH	3,000	
VERY HIGH	30,000	
ULTRA HIGH	300,000 and above	

physics research, electrostatic painting and precipitation, cathode ray oscillography, etc. Attention has been given to safety without a sacrifice of any convenience in operation. Primary safety features include an overload relay and an automatic output voltage shorting solenoid.

1: ENGINEERING DESIGN:

The βeta Electric Series 1000R&D design is the basic standard design for voltage and current, incorporating such features as fine high voltage control, (-F); triple range load current meter , (-M3); etc. described in detail in the Product Data Sheet enclosed.

2: HIGH VOLTAGE CIRCUITS:

The circuit employed is either:

a: Full-wave doubler.
b: Full-wave rectifier.

The circuit for a particular supply is shown in the schematic circuit diagram βc-1000-1. (See Section V re: drawing nomenclature).

3: POLARITY REVERSAL is effected by changing the positions of a set of plugs inside high voltage section. These plugs are accessible by removing the safety shield cover.

4: OUTPUT VOLTAGE CONTROL is by means of a covat* which varies the ac input to the high voltage transformer rectifying circuit. The filaments (when tube rectifiers are used) are continuously energized by separate transformers, thus allowing continuous control of the output voltage.

5: METERING: The output voltage and current are metered, with multiple ranges available in all designs, per Product Data Sheet. Special features of an electrical, metering or control nature are available and listed in the Product Data Sheet.

6: CONTROLS:

1: HIGH VOLTAGE OFF AND OVERLOAD RESET pushbutton. (LOWER RT.
2: HIGH VOLTAGE ON pushbutton. (ABOVE #1)
3: HIGH VOLTAGE CONTROL covat*.
4: METER POLARITY SELECTOR switch.
5: MAIN POWER toggle switch.
6: FINE HIGH VOLTAGE control covat* (BELOW #3)
7: OUTPUT CURRENT METER RANGE selector switch.
8: ZERO START INTERLOCK BYPASS pushbutton. (UPPER RT
9: OVERLOAD TRIP CONTROL rheostat. (UPPER LFT.)
10: OUTPUT VOLTAGE meter range selector switch.

* COVAT - COntinuously Variable Auto Transformer; i.e. powerstat, variac.

physics research, electrostatic painting and precipitation, cathode ray oscillography, etc. Attention has been given to safety without a sacrifice of any convenience in operation. Primary features include an overload relay and an automatic output voltage shorting solenoid.

1: ENGINEERING DESIGN:

The Beta Electric Series 1000RSD design is the basic standard design for voltage and current, incorporating such features as fine high voltage control, (-D); triple range load current meter, (-M3); etc. described in detail in the Product Data Sheet enclosed.

2: HIGH VOLTAGE CIRCUITS:

The circuit employed is either:

a: Full-wave doubler.
b: Full-wave rectifier.

The circuit for a particular supply is shown in the schematic circuit diagram Bc-1000-1. (See Section V re: drawing nomenclature).

3: POLARITY REVERSAL is effected by changing the positions of a set of plugs inside high voltage section. These plugs are accessible by removing the safety shield cover.

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6: CONTROLS:

1: HIGH VOLTAGE OFF AND OVERLOAD RESET pushbutton.
2: HIGH VOLTAGE ON pushbutton.
3: HIGH VOLTAGE CONTROL coyote*.
4: METER POLARITY SELECTOR switch.
5: MAIN POWER toggle switch.
6: FINE HIGH VOLTAGE control coyote*.
7: OUTPUT CURRENT METER RANGE selector switch.
8: ZERO START INTERLOCK BYPASS pushbutton.
9: OVERLOAD TRIP CONTROL rheostat.
10: OUTPUT VOLTAGE meter range selector switch.

* COYAT - Continuously Variable Auto Transformer; i.e. powerstat, variac.

7: PILOT LIGHTS: (ALL NEON WITH FROSTED LENS)

1: MAIN FUSES open (2).
2: OVERLOAD.
3: HIGH VOLTAGE ON.
4: HIGH VOLTAGE INPUT TRANSFORMER FUSE BLOWN.
5: EXTERNAL INTERLOCK OPEN.
6: MAIN POWER.

8: POWER CONNECTIONS:

1: INPUT: Standard recessed 2-pronged male receptacle, with 6 ft. line cord. (IN REAR)
2: OUTPUT: RG 8/U cable, 8 ft. long. (GOOD TO 30KV IF SHIELD IS POSITIVELY GROUNDED
3: GROUND: Screw binding post.

9: AUXILIARY FEATURE:

Standard 2-pronged convenience outlet, energized when the input is energized. (IN REAR)

* *

SECTION III - OPERATING INSTRUCTIONS

A: MECHANICAL:

1: Open the carton or crate and check all panel components for visible damage.
2: Remove the safety shield cover from the high voltage section.

~~For OIL-FILLED high voltage sections; lower the front panel, permitting removal of the tank from the chassis. Remove the screws atop the tank edge from their tapped holes and then raise the lid suspended high voltage components from the tank.~~

3: Remove the tape that binds the output shorting mechanism's plunger, and the rectifiers' plate caps (where used), and also remove any tape used to secure anti-corona nuts during shipment.

4: Insert all tubes that were shipped separately into their corresponding sockets, and connect the plate caps, (where tubes are used).

5: Insert the polarity reversing plugs in proper jacks to correspond to high voltage positive or negative as desired. Refer to parts placement drawing βb-1000-2 and to nameplate on shelf for reversing scheme. (NORMALLY CONNECT FOR NEGATIVE OUTPUT TO MINIMIZE CORROSION OF PARTS AT HIGH POTEN.

~~NOTE: For OIL-FILLED units, fill the tank with clean, dehydrated transformer oil, of at least 25 kv test, Gulf Paramount #33 or equivalent, to the level indicated by the line stamped in the tank, about 2" from the top of tank, before immersing the high voltage components~~

~~into the tank.~~

~~a: Lower the high voltage components slowly into the oil, in order to minimize splashing and oil aeration.~~
~~b: Refasten and replace tank in chassis.~~
c: Connect the control section to the tank by means of the interconnecting cable.
d: Reset front panel.

6: Remove the shorting wires from the meters.

7: Wire an external interlock, closed in the SAFE position, across pins of an ordinary 2-pin wall outlet plug that mates with the socket, on the chassis rear labelled FOR EXTERNAL INTERLOCK.

8: IMPORTANT:

Before replacing the safety shield cover, check the unit electrically by following OPERATING INSTRUCTIONS - ELECTRICAL, (STEPS 1-10). If the unit operates satisfactorily, replace the safety shield cover and mount as desired. (EXTRA SAFETY GROUND BOLTS HAVE BEEN ADDED TO SIDE OF CHASSIS)

B: ELECTRICAL:

1: Ground the unit by means of the binding post provided on the rear of the chassis.

NOTE: ALWAYS OPERATE WITH A GOOD EXTERNAL GROUND. ///

BE CERTAIN THAT ALL PERSONNEL ARE PROPERLY PLACED WITH RESPECT TO THE HIGH VOLTAGE OUTPUT CABLE. THIS MEANS THAT NO ONE SHOULD BE WITHIN 1/2 FOOT OF THE OUTPUT END, UNLESS HE KNOWS EXACTLY WHAT HE IS DOING.

DANGER: ALTHOUGH A LETHAL AMOUNT OF POWER MAY NOT BE AVAILABLE FROM THE POWER SUPPLY ITSELF, SECONDARY MECHANICAL EFFECTS DUE TO MECHANICAL MOVEMENT CAN BE DANGEROUS. ALSO, IF A CAPACITANCE IS BEING TESTED AT VOLTAGES SUCH THAT $1/2\ CE^2$ IS GREATER THAN 27, A LETHAL AMOUNT OF STORED ENERGY MAY BE AVAILABLE. (1).

(40 TO 100 MEGOHMS MAY BE USED IN L-2 RIMPLE FILTER IF LETHAL HAZARD IS 5,000 V)

2: Connect output cable to load in such a position that it will not be in close proximity to ground. Keep away from all personnel.

NOTE: High voltage output cables for units below 30 kv are terminated in alligator clips, while those for oil units are stripped back but remain unterminated.

3: Turn the HIGH VOLTAGE CONTROL to zero. Check that the MAIN POWER switch is in the OFF position.

4: Connect the power supply to a source of nominal 117 volts or 220 volts (2-6-1) feature only, 50/60 cycles, single phase, by means of the line cord provided.

(1) "Effects of Electric Shock on Man" by Prof. Charles F. Dalziel. Reprinted from I.R.E. Transaction on Medical Electronics - May 1956 (PGME-5). (Available from βeta Electric Corp.).

5: Set the METER POLARITY selector switch TO ("+" or) "-", corresponding to the setting of plugs and jacks in the high voltage section, per Section III, A, 5.

6: Set OUTPUT VOLTAGE AND OUTPUT CURRENT METER range selector switch to the range desired.

7: Set the MAIN POWER switch to ON.

8: Set the OVERLOAD TRIP CONTROL to the desired trip current. Refer to drawing βa-1000-5 for the calibration of trip current vs. overload trip control setting. (TRIP-RANGE IS 3.5MA TO 30MA (DO NOT SET HIGHER THAN 10MA-SEE DIAL CALIB CHART

9: Set the HIGH VOLTAGE CONTROL to zero. ~~(Recommended, but not~~ (mandatory).

Depress the HIGH VOLTAGE ON pushbutton.

a: For high voltage surge, also depress the ZERO START INTERLOCK BYPASS pushbutton. Keep button depressed until the "overload" pilot light I4 is extinguished.

10: Turn the HIGH VOLTAGE CONTROL clockwise until the rated output voltage and/or current is indicated.

11: TURN OFF: PROCEEDURE

a: Turn the HIGH VOLTAGE CONTROL to zero (advisable, not mandatory).
b: Depress the HIGH VOLTAGE OFF pushbutton.
c: SET the MAIN POWER switch to OFF. (FOR COMPLETE TURNOFF OF H.V. SYSTEM ONLY)

NOTE: Allow the OUTPUT VOLTAGE meter to fall below 5% of rated voltage, (AFTER STEP "a") before depressing the HIGH VOLTAGE OFF pushbutton. This obviates the possibility of unexpected high voltage appearing when the high voltage on pushbutton is again depressed. Further, it minimizes arcing at the automatic output shorting mechanism with consequent contact deterioration.

* * * * * In case of emergency, there should be no hesitation to depress the HIGH VOLTAGE OFF pushbutton atonce.

12: <u>TO RESET AFTER AN OVERLOAD:</u> **
a: Remedy the condition that caused the overload.
b: Turn the HIGH VOLTAGE CONTROL to zero.
c: Depress the OVERLOAD RESET pushbutton.
d: Repeat steps 8 through 10 above.

** All power supplies have a protective spark gap. It will fire if the output voltage is raised approximately 10% above the rated maximum, and will cause an overload to be indicated. THE METERS ARE PROTECTED AGAINST OVERLOADS ON ALL RANGES.

* *

* * * *

SECTION IV - THEORY OF OPERATION

All of the circuits and functions of the power supply are quite straightforward and can be readily understood by reference to the basic schematic circuit diagram, ~~βc-1000-1~~ herewith. (See note in Section V re drawing nomenclature). βc-1030-20-A&D-3

Main ac power and dc circuits are indicated heavily. Light lines represent circuits for controls, meters, filtering or indicating devices. The detailed replacement parts list herewith describes the function of each component.

Several novel features, introduced in 1946 and pioneered by βeta Electric, are briefly outlined herewith. In addition, unusual circuit features are described:

1: BLOWN FUSE AND OPEN SWITCH INDICATORS:

Neon glow lamps, such as I1, shine when the paralleled fuse is blown, or paralleled switch is open, thus indicating immediately the cause of inoperation of the power supply. The lamp holders have built-in resistors, limiting the lamp current to approximately 1 milliampere, so that none of the circuit BEYOND THE LAMP will be operated by the small current that flows through the lamp.

2: NEON PILOT LIGHT CURRENT RETURN RESISTORS:

Resistors such as R1 ensure illumination of the adjacent neon glow lamp in case of blown fuse or open switch paralleled by the indicator and an open circuit beyond the resistor.

3: HOLDING RELAY FOR OVERLOAD PROTECTION:

Relay K1 pulls in when contacts 3a of the overload relay K3 close momentarily. When K1 is energized, contacts 1b open, de-energizing all of the high voltage circuits; also, contacts 1a close and maintain K1 energized, even though contacts 3a have now opened up, due to contacts 1b having opened, and having removed primary power from the high voltage circuit, thus eliminating the overload condition. Depressing S1, HIGH VOLTAGE OFF & OVERLOAD RESET, de-energizes K1 and resets the system for operation after the overload.

Pilot light I4, OVERLOAD, is illuminated for the overload condition.

4: HIGH VOLTAGE "HOLDING":

When the HIGH VOLTAGE ON pushbutton S2 is depressed, solenoid K2 is energized, removing the short from the output, through resistor R5. At the same time, K4 is energized, closing contact 4c, thus bypassing S2 and allowing S2 to be released, maintaining high voltage.

5: HIGH VOLTAGE GENERATING CIRCUITS:

The high voltage is controlled by the output of covat T1, which varies

from 0 to 135 volts, the ac input voltage to the high voltage transformer T2.

The output of T2 is rectified by means of rectifiers and filters in a circuit that is most economical for the particular application. The circuits employed are:

a) Full-wave doubler ~~(most common)~~ *
~~b) Full-wave rectifier (for high current)~~

* 6: POLARITY REVERSAL:

The high voltage is made (positive or) negative with respect to ground by means of reversing the sense of the rectifiers. This reversal is accomplished by means of plugs and jacks located on a shelf in the high voltage section. (SEE DWG 1030-20-RED-2)

7: METERING AND OVERLOAD CIRCUITS:

The output voltage metering circuit consists of resistor R4 in series with meter M1, OUTPUT VOLTAGE, and the series (R6) and shunting (R11, R12, and R13) calibrating resistors.

It is to be noted that the return of the output voltage metering circuit is not to ground, but to the "high" end of the OUTPUT CURRENT metering circuit M2. Thus, the output current meter does not indicate the current drawn by the kilovoltmeter circuit.

In series with the OUTPUT CURRENT meter M2 is the overload relay K3. This relay is calibrated to ensure pull in at the rated currents.

Capacitor C5 allows the relay K3 to pull in on average current, rather than the large peak currents that flow through the rectifier circuit.

* *

SECTION V - DRAWING NOMENCLATURE

Each drawing has designations showing size number, the MODEL NUMBER of the power supply, and the drawing sequence, thus:

a) "a" size - 8-1/2" x 11"
b) "b" size - 11" x 17"
c) "c" size - 17" x 22"

i.e. a model 1010-50R&D has Bb-1010-50R&D-2 etc.

* D.L. WAIDELICH, "THE FULL-WAVE VOLTAGE DOUBLER RECTIFIER CIRCUIT", PROC. OF I.R.E., OCTOBER 1941, PP. 554-558, incl.

from 0 to 15 volts, the ac input voltage to the high voltage transformer T2.

The output of T2 [illegible] of rectifiers and filters in the circuit card [illegible] the pos tronic application. The circuits employ

[illegible]

the high voltage is additionally controlled with respect to ground by means of resistors the sense of the rectifiers. This results in zero potential by means of plug P16 located on a shelf in the high voltage section.

The output voltage metering circuit consists of resistor R4 in series with meter M1, CR17, CR18, and the series (or) and associated (by) (or) (by) (or) (by) calibrating resistors

It is to be noted that the return of the output voltage metering circuit is not to ground, but to the "input" end of the [illegible] metering circuit. Here, the output current does not include the current drawn by the microtronics circuit.

In series with the OUTPUT CURRENT meter M2 is the overload relay K3. This relay is calibrated to [illegible] in at the rate. contacts.

[illegible] the relay K3 to pull in at [illegible] current. [illegible] the large pass current must flow through the rectifier circuit.

* * * *

SECTION V - DRAWING NOMENCLATURE CONTINUED

βc-1000-R&D-1 → βc1030-20-R&D-1

1: ~~βc-1000-R&D-1,~~ a schematic circuit diagram of the entire power supply. The power and high voltage dc circuits are indicated with heavy lines. Electrical specifications for the particular power supply are tabulated thereon.

βb-1000-R&D-2 → βc1030-20-R&D-2

2: ~~βb-1000-R&D-2~~, showing parts placement on the control panel and chassis, and in the high voltage section. Mechanical specifications of the particular power supply are tabulated thereon.

βc-1000-R&D-3 → βc1030-20-R&D-3

3: ~~βc-1000-R&D-3~~, a schematic wiring diagram of the entire power supply. This is a point-to-point wiring diagram, indicating that all wires are number coded for ease of trouble shooting and component isolation, except in the high voltage section, or for short jumpers, readily traced, in the control section.

4: βa-1000-R&D-4, a calibration curve of the no load output voltage vs. the HIGH VOLTAGE CONTROL setting.

5: βa-1000-R&D-5, a calibration curve of the OVERLOAD TRIP CONTROL setting vs. the current at which the overload relay will pull in.

The below listed drawings will only be supplied for optional features:

6: βc-1000-7, a schematic wiring and parts placement drawing for the line voltage regulator (L2 feature)

βb-1000-8 → 1030-20-L2

7: ~~βb-1000-8~~, a schematic wiring diagram and parts placement drawing for the filter section. (L2 feature).

* *

SECTION VI - SERVICE AIDS

I. CAUTION:

When trouble shooting, be certain that all personnel are properly placed with respect to the output cable. There are dangerous high voltages present in this supply and should be serviced ony by informed and skilled personnel.

II. ASSUMPTIONS:

A: The following tests apply only to the High Voltage section and assume that the control section is in operating condition.

B: This does not preclude the possibility that fuses are blown, circuit breakers are open or that the interconnecting cable (if any) is improperly connected.

C: The operation of the control section can be readily understood by referring to Schematic Circuit Diagram (1st drawing) and

1030-20-R&D-1

Schematic Wiring Diagram (3rd drawing). 1030-20-REV-3

III. POWER SUPPLY TROUBLE VS. APPLICATION TROUBLE:

A. The first thing to determine is whether the difficulty is the βeta power supply or your application.

This can be determined by making the following tests:

1. LOAD DISCONNECT:

Disconnect output ~~cable from load.~~ LOAD (Hang output cable in air away from ground and all personnel. ONLY IF DISASSEMBLED FROM RACK)

2. NO LOAD TEST:

Raise H.V. CONTROL on front panel until kilovoltmeter reads rated maximum output voltage. (30,000 V-DC (Leave on for approximately 1/2 hour). If trouble does not develop, then:

a) Turn HIGH VOLTAGE CONTROL to zero. Turn unit off.

3. SHORT CIRCUIT TEST:

Connect output cable tip (H.V. end) to ground. Turn overload trip control on front panel full clockwise. Raise HIGH VOLTAGE CONTROL on front panel very slowly until ~~rated~~ output current OF 10MA is read. (Leave on for approximately 1/2 hour). A small rotation (approximately 10%) of the HIGH VOLTAGE CONTROL should give full current. Turn unit off.

B. If the above tests show normal power supply operation, the trouble is most likely in your load application. We suggest you contact our representative in your area for assistance.

C. If power supply operation is not normal, then proceed as follows:

(1) If the NO LOAD TEST is satisfactory, and the SHORT CIRCUIT TEST is not, refer to Trouble Shooting Section V.

(2) If the SHORT CIRCUIT TEST is satisfactory, and the NO LOAD TEST is not, refer to Trouble Shooting Section VI.

(3) If flashing or arc-over occurs in the High Voltage section before rated output voltage is obtained in the NO LOAD TEST, refer to Trouble Shooting Section IV.

(4) If no output voltage or current is obtained in the NO LOAD TEST and the SHORT CIRCUIT TEST, refer to Trouble Shooting Section VII.

IV. FLASHING IN HIGH VOLTAGE SECTION:

NOTE: Overload relay may trip after flashover. This can be determined by pilot light on front panel.

PROBABLE CAUSE	REMEDIAL ACTION
IMPROPER LOAD:	
Load may be open or acring to ground.	Remove load and check unit at no load.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** OIL AERATION:	
This usually occurs when High Voltage section is untanked frequently. Entrapped air will cause some loss of insulation properties of oil.	Before raising output voltage, allow frame to set in oil approximately 1 hour to remove major air pockets. Unit may be operated at 1/2 voltage to help drive out excess air.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** INSUFFICIENT OIL:	
Oil level must be approximately 1/2" from top of tank cover.	Fill oil to approximately 1/2" from top of tank cover with the frame in place.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** CONTAMINATED OIL:	
This will lower the dielectric strength of the oil.	Filter or replace oil.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
BROKEN LEAD(s):	
Leads may be disconnected and cause arcing.	Inspect High Voltage section for broken leads on transformers tubes, capacitors, etc. (INSPECT OUTPUT CURRENT LIMITING RESISTORS FOR OPENS) (I.E. IN L2 FILTER SECTION AND ON OUTPUT CURRENT-LIMITER PANELS)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

** Oil insulated units only.

PROBABLE CAUSE	REMEDIAL ACTION
Overvoltage gap not set properly. (where spark gaps are used).	Should be set so that overload trips at approximately 10% over-voltage. (WHERE L2 FILTER SECTION IS USED, CONSIDERABLE REGULATION EXISTS)
* * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *

FOREIGN MATTER IN HIGH VOLTAGE SECTION:

Objects such as screws, nuts, bits of metal floating above ground potential may cause arcing.	Inspect for foreign matter such as nuts, screws, pieces of wires etc. wedged in frame or cabinet. Remove.
* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *
** Output cable not seated properly.	Check to see that cable plug mates properly with jack.
* * * * * * * * * * * * * * * * * * *	* *

** IF the cause of flashing is not eliminated by any of the above remedial actions it will be necessary to remove ~~the frame from~~ the tank and raise the output voltage ~~to 1/3 rated output voltage~~ in air: DO NOT RAISE ABOVE 1/3 RATED VOLTAGE ~~IN AIR.~~ Watch for signs of corona and/or arcing as they usually indicate source of trouble. There are dangerous High Voltage present and extreme caution should be observed. (IE; 30,000 V.-D.C.)

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V. NO OUTPUT CURRENT (Output Voltage O.K.):

Shorting wire across meter terminals.	Inspect rear of control panels. Remove short.
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No ground connection.	*** — Connect a common ground to load and all metal housings. (Tanks and cabinets.
* * * * * * * * * * * * * * * * * * *	* *
Calibrating potentiometer in meter circuit shorted.	Check potentiometer for short with ohmmeter. Isolate circuit as required.
* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *
Defective meter.	Check power supply meter against standard meter.
* * * * * * * * * * * * * * * * * * *	* *
Open load.	Check load.
* * * * * * * * * * * * * * * * * * *	* *

If above do not succed in locating the difficulty, remove the load and place a milliammeter between output and ground. Observe proper polarity. If current is read, the trouble is probably in the milliammeter circuit in the control section.

Notify our representative in your area for assistance if none of the above remedy your difficulty.

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VI. NO OUTPUT VOLTAGE (Output Current O.K):

Shorting wire across meter.	Inspect rear of control panel. Remove short.
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Calibrating potentiometers across meters shorted.	Check potentiometer for short with ohmmeter. Isolate circuit as required.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Defective meter.	Check power supply meter against standard meter.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Load shorted.	Check load.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

VI. NO OUTPUT VOLTAGE (Output Current O.K.):

Output shorting mechanism binding or defective.	Check output shorting solenoid. This solenoid should be activated when the High Voltage ON button is depressed.
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Defective kilovoltmeter multiplier resistor(s).	Check resistance. (This is usually in the order of megohms)
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If above do not succedd in locating the difficulty, remove load and place a kilovoltmeter from output to ground. Raise HIGH VOLTAGE CONTROL until meter reads. (The voltage read is limited by the capability of the external meter) If voltage is being generated, the trouble is probably in the kilovoltmeter circuit. Notify our representative in your area for assistance if none of the above remedy your difficulty.

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VII. NO OUTPUT VOLTAGE OR CURRENT:

PROBABLE CAUSE	REMEDIAL ACTION
Shorting wires across milli-ammeter and kilovoltmeter.	Inspect rear of control panel. Remove short.
Tubes (if any) not in socket or defective.	Check for proper seating of tube in socket. Filaments should be lit. If not, check tubes and/or filament transformer(s).
Reversing plugs. Improperly connected or not connected.	Check for proper seating of reversing plugs.
High voltage transformer defective.	Check to see if any output voltage is obtained by placing an ac kilovoltmeter from the high end of transformer to ground.
High voltage transformer input fuse blown or circuit breaker open.	Replace fuse or close breaker. NOTE: The indicating lamp on the front panel will not light unless the HIGH VOLTAGE CONTROL is brought up to about 60 on the dial.

If none of the above remedy the difficulty, please call our representative in your area.

VII. NO OUTPUT VOLTAGE OR CURRENT:

PROBABLE CAUSE	REMEDIAL ACTION
Shorting wires across milli-ammeter and kilovoltmeter.	Inspect rear of control panel. Remove short.
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